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ABSTRACT

The study is concerned with the recall or recognition of science principles one day after they have been taught and the ability of students to answer higher level transfer items involving the principle. The short term recall and recognition involved students who prior to/learning experience could neither recall nor recognize the science principles. Transfer ability was indicated by the ability to answer items that required the direct extrapolation of the principle, the application of the principle to new problem situation, and the ability to analyze statements, regarding the principle. No difference was found in the prediction possible from the short term recall and recognition data. (Author)

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SUMMARY ABSTRACT

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The question of the relative worth of recall versus recognition responses has important implications for classroom management. It has implications for the teacher in terms of the curricular decisions he makes including choosing the kind of measure of student learning he will use, and implications for the student in terms of the kind of studying that will pay off.

For example, Sax and Collett (1968) found that recognition (multiple choice) examinations are able to motivate students to perform as well as recall-type questions when items are relatively difficult and where the criterion task is a recall examination. They also found that training on multiple choice tests yields higher scores on multiple choice criterion tasks than does training on recall exams. Such a finding may indicate the desirability of using the recognition rather than the recall items.

But perhaps a more important aspect of the recall-recognition issue concerns the relative value of different classes of test items for predicting the ability of the student to transfer the content measured. Most teachers are aware that both recall and recognition items can be answered by students who have memorized content and who may or may not be able to transfer the material. However, if one type of response can be shown to be more indicative of the ability to transfer the material than the other, then a strong case could be made for soliciting that particular class of response.

An examination of the recall-recognition question leads into the never-never land between learning research and measurement. There is a very close relationship between the recall-recognition problem in measurement and the retention transfer

problem in learning research. They relate insofar as the variables which affect the student's ability to respond correctly to recall or recognition items may be the same variables which promote the transfer of the content involved in the responses.

Of importance to this point of view is a study conducted by Smith and Mangum (1969) in which they found that students who were able to recall science principles over long periods of time (six months) were able to transfer these principles more often than those students who could only recognize them. In this study transfer meant the availability of a principle in order to "extrapolate" the principle, "apply" the principle, "analyze" statements regarding the principle, and "infer" the next logical question to be asked or experiment to be performed.

The Smith-Mangum study has clear implications for the classroom teacher in terms of the measurement question of recall versus recognition. However, since most classroom testing normally follows immediately after a unit of instruction, this study will investigate the transfer-retention question for short term memory.

Specifically, this study was concerned with the relationship between the ability of students to recall or recognize science principles and their ability to transfer these principles. Transferability was indicated by the ability to answer test items that required (1) the direct "extrapolation" of the principles; (2) the "application" of the principles; and (3) the ability to "analyze" statements regarding the principle.

Method

Subjects

The subjects for this study were two-hundred elementary and junior high school students. These students were science pupils enrolled in classes of four teachers who were taking an in-service course with one of the writers. The students were directed through the several stages of this study by their regular classroom instructors.

Procedure

The science principles used in the study concerned Mendel's law for predicting the characteristics of the offspring produced by crossing two hybrids, the principle of buoyancy and the formula for the balancing of a simple lever.

The four participating teachers first administered two pretests to establish if some of the students already knew any or all of the principles before the actual teaching began. The first test was open ended recall and required students to construct responses indicating a knowledge of the principle. For example, if a student wrote that an object would sink until it has displaced its own weight in water, it was acknowledged that he had already attained the principle of buoyancy. The second pretest (recognition) included six multiple choice items in which the students were required to identify each generalisation from a group of alternative responses. For example, one of the items read:

> Suppose E is the force on one end of the lever, and E D is the distance between this force and the fulcrum, R is the force on the opposite end of the lever, and D R is the distance between R and the fulcrum. Which of the following statements is true?
> A. E x DE = R x DR
> B. E x DR = R x DE
> C. E x R = DE x DR
> D. E x DE = E x DE

A student's ability to recognize the principle was acknowledged when he correctly identified the generalization in <u>both</u> of the items relevant to that principle.

When pretest knowledge, either recall or recognition, for a student was demonstrated for a particular principle, all further data collected for that student for that principle was excluded from the study. The students were not, however, given the results of their pretest, and all participated in the entire experiment.

After the pretests were given and collected, the students were given instructions by their regular teachers designed to lead to the learning of the three principles described. The teachers used handouts prepared by the investigators as part of their instructional materials. Two class periods were used for instruction.

On the third day, the teachers administered posttests to their students. The first test, a recall exam, was identical to the recall pretest. This test identified those students who could recall the principle. The second posttest was the same as the first recognition test except that the order of the items was reversed. Correct answers to the two "knowledge of principle" items was required to demonstrate mastery. This was done to reduce the probability of correctly guessing the principle.

On the basis of the posttest, three separate groups were formed for each principle. The first group consisted of those students who were able to recall or reconstruct a response for a principle. but who were unable to recognize the principle. The second group could recognize a principle, but could not reconstruct the principle on the recall posttest. A third group consisted of those students who could both recognize and recall a particular principle on the posttests. The procedure was repeated for each of the three principles used in the study. Naturally, there were students who did not get any of the items correct. These students did not contribute data to the reporting.

After the recall and recognition groups were established, a final posttest was given. This third test -- containing items corresponding to the "extrapolation," "application," and "analysis" catagories as described above -- was designed to measure the student's ability to transfer the principles. A mean score (number of items right) on the transfer test was determined for each group on each principle. These scores were then compared.

Results

The mean scores are shown below.

TABLE ONE

Resultant Means on the Transfer Test for Students in Each of the Three Categories for Each of the Three Principles.

ITEM SET	N Recall	Mean Recall	N Recognition	Mean Recognition	N Recall-Recog.	Mean Recall-Recog.
LEVER	15	5.8	10	7.1	18	6.9
BUOYANCY	30	5.55	18	5.89	10	7.3
MENDEL'S LAW	11	3.38	23	3.43	24	4.5

The three mean scores for each of the principles were compared to determine if any significant differences existed between them. No significant differences were found.

Discussion

This study, which was concerned with the vertical transfer of potentially meaningful science principles one day after learning, indicates that neither short term recall nor short term recognition of the principle is more indicative of the ability to transfer. This finding differs from the Smith-Mangum study insofar as they found that long term recall was more indicative of the ability to transfer the principles than long term recognition. Removing those students who were able to recall or recognize the principle on the pretest and retaining only those who learned the principles as a result of classroom instruction a day or two before the post test altered the result. The data would seem to indicate that the long term-short term dimension is an important variable in determining the relationship between response availability and transfer.

The study indicates that for the initial learning of new relationships,

practical considerations such as scoring reliability and the ability to require precise discrimination in students' responses would tend to favor the use of recognition items in measuring pupil progress. However, for pretesting and evaluation involving long term retention, the evidence that recall is more in indicative of the ability to transfer the relationship should be considered.

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